

# Threats to biodiversity

‘Most of the world’s endangered **species** — some 25% of mammals and 12% of birds — may become **extinct** over the next few decades as warmer conditions alter the forests, wetlands, and rangelands they depend on, and human development blocks them from migrating elsewhere.’

*From UN Framework Convention on Climate Change, 2006.*

Human activity has meant huge environmental changes for millions of Earth’s species. Some of the biggest changes have been:

- habitat loss — we have replaced huge areas of forest and grassland with agricultural crops, plantation timber and livestock. One-fifth of the world’s rainforests were cut down between 1960 and 1990.
- climate change — industrial and agricultural development have increased the greenhouse gases in the atmosphere, in turn

increasing Earth’s atmospheric temperature, which may cause an increase in sea levels.

- overexploitation — fishing, hunting and poaching have massively reduced populations of many species. Human demand for resources has skyrocketed as the population has tripled in the last 100 years.
- pollution — industries and mining have destroyed areas of natural habitat.

What has been the evolutionary impact of these activities?

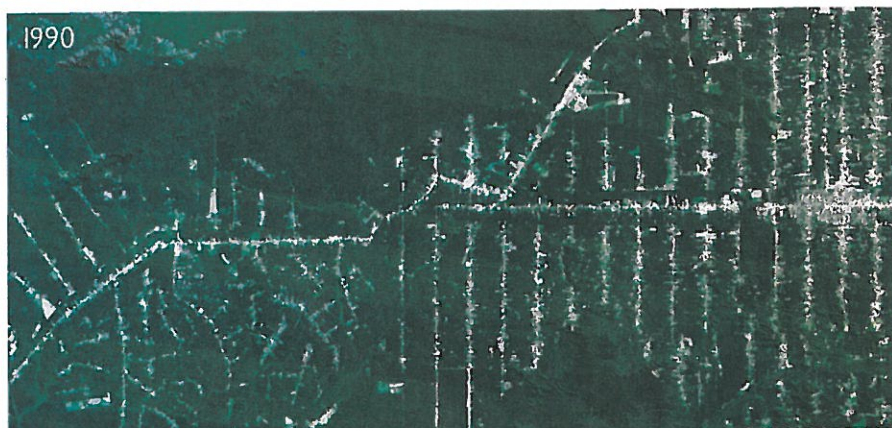
## Loss of biodiversity

The term **biodiversity** means the variety of ecosystems and species that occur on Earth. Within species, diversity refers to the array of genetic differences that are present.

In the course of human development, whole, unique ecosystems have been destroyed. In those ecosystems which survive, many species are under threat. The loss of species generally makes an ecosystem less stable, since species interact and depend on each other for survival. Humans, too, are dependent on a great range of living things to maintain the atmosphere, and provide food and habitats. We also rely on the less obvious ‘services’ that ecosystems provide: recycling nutrients, climate control, and the purification of air and water.

## Monocultures

In a natural ecosystem, a huge variety of organisms interact and balance each other’s effects. But in a crop such as a pine plantation, for example, the diversity of species has been replaced by a large stretch of one single species (called a **monoculture**). Without the variety of species, very few other organisms can find what they need to survive. In ecological terms, the plantation is almost ‘dead’. Economically this may be the most efficient way to produce the vast quantities of wood that society uses for paper, construction and so on. But, it dramatically reduces species’ diversity.



The top photo of the Amazon rainforest was taken in 1990, the lower photo in 2000. In the last 30 years, Brazil alone has lost five million acres of rainforest.

Human activities can even lead to some native species becoming invasive weeds or pests. For example, large areas of crops and more frequent water points have allowed the galah to increase its range and colonise most of Australia, where it competes with other local species.

### Another mass extinction?

Faced with habitat loss or degradation, many species have been unable to survive, and have become extinct. It is estimated that a third of all amphibian species, a fifth of mammals and an eighth of all birds are threatened with extinction.

### Saving species

Environmental scientists, biologists, geneticists, as well as many non-scientists are working together to try to slow the loss of species. Protecting and renewing habitat is a vital part of the process.

In Australia, there are 15 biodiversity hotspots that are rich in animal and plant life, and under threat of destruction due to land clearing, feral animals, weeds and overdevelopment. One of these hotspots is the Victorian Volcanic Plain, just outside Melbourne. It is home to the Orange-bellied parrot, which is now endangered because most of the Plain has been converted to pasture, and the parrot's natural habitat of grassy woodlands and wetlands has been destroyed. There are an estimated 200 Orange-bellied parrots remaining, and it is now one of the world's rarest birds.

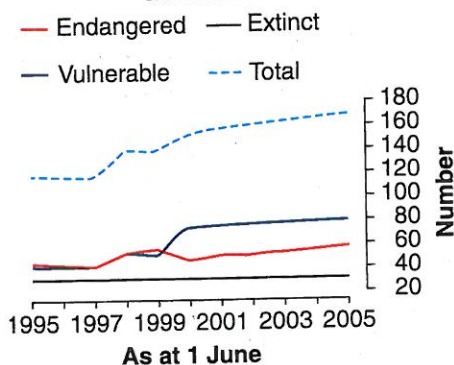
Strategies to save the Orange-bellied parrot involve protecting vulnerable habitat, including southern Australian salt marshes, beaches and dunes; controlling fox and cat numbers; captive breeding and release into the wild; monitoring **inbreeding** in the captive population; and making regular counts to see how the birds are surviving in the wild.



## Australia, home of the unique

Australia is home to more than one million species of plants and animals, and many are unique to Australia. Around 85% of Australia's species of flowering plant, 84% of our mammal species, at least 45% of our bird species, and 89% of our inland, freshwater fish are **endemic** — they are found only in Australia!

### Biodiversity: Extinct, endangered and vulnerable birds and mammals\*



The number of endangered and vulnerable bird and mammal species in Australia continues to grow.

\* Excludes seabirds, marine mammals and animals living on islands far offshore. Extinctions data have been backcast to take account of rediscoveries, including subspecies. There is likely to be a time lag between a species being identified as threatened and being listed.

Source: Data compiled from schedules to the Commonwealth Acts: the *Endangered Species Protection Act 1993* and the *Environment Protection and Biodiversity Conservation Act 1999*.

Plants use carbon dioxide and release oxygen.

Plants provide shelter and food.

Animals fertilise soil; organic matter is broken down; and nutrients are recycled.

Roots stabilise soil.

A natural ecosystem

## Weeds and pests

Human colonisation of the planet has resulted in non-native species being introduced into many ecosystems. Some species have **adaptations** that allow them to thrive in a range of circumstances, even outside their natural habitat. For example, plants that reproduce rapidly, have a short life cycle, and are tolerant of a wide range of environments and soils can easily become **weeds** (plants that grow where they are not wanted).

**Pests** are animals that are not wanted in a particular location. Often, **introduced species** of animal become pests because they have no predators to control their population size. They may take food and habitat from other natural species occurring in the area, threatening their survival. The introduction of non-native species can increase the development of parasites and disease and allow an increase in other pests. Some introduced species are capable of changing the entire habitat; for example, feral goats, pigs, and buffalo cause erosion of soil in outback Australia.



## AUSTRALIA'S MOST UNWANTED

1. The blackberry was introduced by European settlers in the early 1800s. It outgrows and smothers native species, and harbours feral animals.
2. Cane toads reduce native species due to predation, competition for food, the poisoning of species attempting to prey on them, and transmittance of diseases to native frogs and fishes.
3. The rabbit, like many other species including the fox, was brought from England by settlers wanting to make Australia more like 'home'. Since 1859, it has outcompeted native animals, destroyed habitats and contributed to soil erosion.



# Activities



## REMEMBER

- 1 Name four major environmental effects of human activity on the Earth.
- 2 What is *biodiversity*?
- 3 What impacts can introduced species have on ecosystems?

## THINK

- 4 The water hyacinth was a major weed in Australian and overseas' waterways until biological control was used. Looking at the photo below, what impact would this weed have on biodiversity in the waterways it infests?
- 5 How can a native species become a weed or a pest?

## IMAGINE

- 6 A remote valley in the Otways has been explored by humans for the first time, and it has been found to be home to a small population of a new species of possum. You have been appointed to manage the area. What strategies will you put in place to protect the newly discovered species?
- 7 Write an account describing the world's ecosystems in 2050 if human activities continue as they are now. Then write a second story, describing how the world would be in 2050 if all further human development was halted from today.

## DEBATE

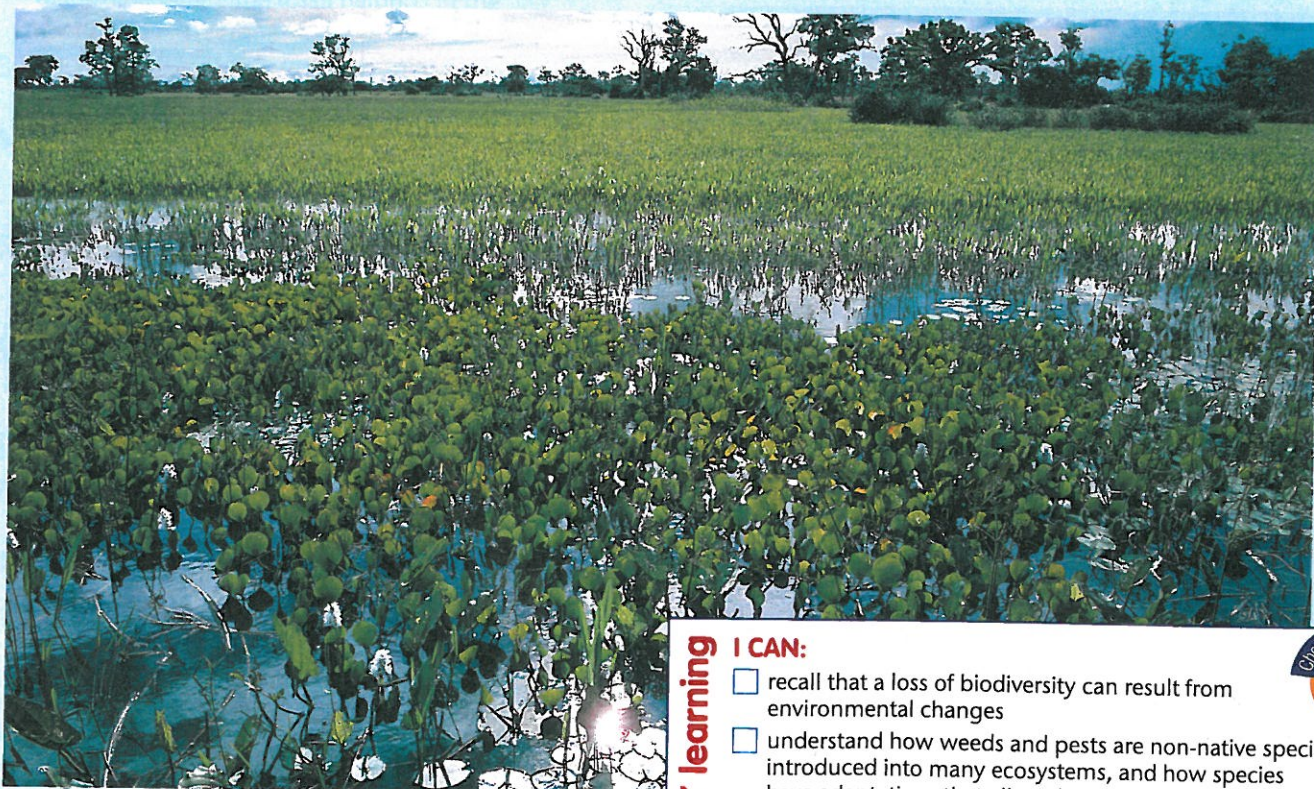
- 8 Arrange teams to debate the statement: 'It is more important to feed all humans than to save species that do not affect human welfare'.

## INVESTIGATE

- 9 The Asian elephant is a close relative of the extinct Woolly mammoth, and is considered an endangered species. Investigate the different theories proposed to explain why the Woolly mammoth died out, and why the Asian elephant is threatened. Comparing them, what are the key differences?
- 10 Through the internet or the library, find out which ecosystems and species in Australia are considered threatened and why.
- 11 Use the internet to find out when some or all of the following pest species first arrived in Australia:

Fox, rabbit, cat, camel, pig, goat, prickly pear, blackberry, *Mimosa pigra*, fire ant, black striped mussel, Northern Pacific seastar, boneseed, gorse, *Pythophthera*, European wasp

Prepare an illustrated timeline showing these dates and the species. If you find out any facts on how quickly they spread, include those too. You could extend this activity by investigating and adding the dates on which native Australian species became extinct.



✓ learning

### I CAN:

- ☐ recall that a loss of biodiversity can result from environmental changes
- ☐ understand how weeds and pests are non-native species introduced into many ecosystems, and how species have adaptations that allow them to thrive in a range of circumstances outside their natural habitat.

